

What is claimed is:

1. An image forming apparatus which forms a toner image on an image carrier based on image data which are fed, wherein

a toner consumption amount is calculated based on a total of a first integrating value which is obtained by integrating a first toner amount which is consumed during an ordinary toner image forming operation, and a second integrating value which is obtained by integrating a second toner amount which is consumed during an operation under a non-ordinary mode which is different from the ordinary toner image forming operation.

2. The image forming apparatus of claim 1, further comprising storage means which stores an offset value which is set in advance corresponding to the operation under the non-ordinary mode,

wherein the offset value is used as the second toner amount.

3. The image forming apparatus of claim 2, wherein said storage means stores a plurality of offset values set in advance corresponding to a plurality of operations under the non-ordinary mode respectively, and

when an operation under the non-ordinary mode is executed, the offset value which corresponds to the operation is extracted from said storage means, and thus extracted offset value is used as the second toner amount.

4. The image forming apparatus of claim 3, wherein the plurality of operations under the non-ordinary mode include at least two operations out of an image forming condition adjusting operation, a toner covering operation, a refreshing operation and an idling operation of toner supplying means.

5. The image forming apparatus of claim 2, further comprising offset value setting means which changes the offset value in accordance with an operating state of said apparatus.

6. The image forming apparatus of claim 2, further comprising offset value setting means which changes the offset value in accordance with a history of use of toner.

7. The image forming apparatus of claim 2, further comprising offset value setting means which changes the offset value in accordance with an image forming condition which is used in forming the toner image.

8. The image forming apparatus of claim 1, wherein the number of print dots which constitute the toner image is counted based on the image data, and the first toner amount is calculated based on thus counted number of print dots.

9. The image forming apparatus of claim 1, further comprising a judging means which judges a toner end when the toner consumption amount thus calculated exceeds a predetermined value.

10. A method of calculating a toner consumption amount for use in an image forming apparatus which forms a toner image on an image carrier based on image data which is fed, said method comprising the steps of:

calculating a first toner amount which is consumed during an ordinary toner image forming operation; and

calculating a second toner amount which is consumed during an operation under a non-ordinary mode which is different from the ordinary toner image forming operation,

wherein a total toner consumption amount is calculated based on a sum of a first integrating value which is obtained by integrating the first toner amount and a second integrating value which is obtained by integrating the second toner amount.

11. An image forming apparatus, comprising:

image forming means which forms a toner image on an image carrier based on an image signal which is fed; and

detecting means which detects a toner amount of toner which is consumed as said image forming means forms a toner image,

wherein a toner consumption amount is calculated based on an

integrating value which is obtained by integrating the toner amount detected by said detecting means,

as routes for feeding the image signal to said image forming means, a first route and a second route which is different from said first route are provided, and

said detecting means executes a first toner amount detecting process which is based on the image signal which is fed to said image forming means through said first route, executes a second toner amount detecting process which is based on the image signal which is fed to said image forming means through said second route, and ensures that the first toner amount detecting process is different from the second toner amount detecting process.

12. The image forming apparatus of claim 11, further comprising:

first controlling means which receives image data, generates an image signal corresponding to the image data, and sends the image signal to said image forming means through said first route; and

second controlling means which sends to said image forming means an image signal corresponding to an image pattern set in advance through said second route,

wherein said image forming means forms a toner image corresponding to the image data based on an image signal fed from said first controlling means through said first route, and forms a toner image

corresponding to the image pattern based on an image signal fed from said second controlling means through said second route, and

said detecting means detects the toner amount based on the image data as the first toner amount detecting process, and detects the toner amount based on the image pattern as the second toner amount detecting process.

13. The image forming apparatus of claim 12, further comprising storage means which stores, as an offset value, a toner amount of toner which is consumed when a toner image corresponding to the image pattern is formed,

wherein when an image signal is fed to said image forming means from said second controlling means through said second route, said detecting means determines that the toner amount is the offset value in the second toner amount detecting process.

14. The image forming apparatus of claim 13, wherein

said second controlling means is structured to send out a plurality of image signals corresponding respectively to a plurality of image patterns set in advance to said image forming means,

said storage means stores a plurality of toner amounts, each as the offset value, of toner which are consumed when toner images corresponding to the plurality of image patterns are formed, and

when an image signal is fed to said image forming means from said

second controlling means through said second route, said detecting means extracts the offset value corresponding to the image pattern of the image signal from said storage means and determines that the toner amount is the extracted offset value.

15. The image forming apparatus of claim 12, wherein

said image forming means includes exposure means which forms an electrostatic latent image on said image carrier and developer means which makes toner adhere to said image carrier, thereby visualizing the electrostatic latent image,

a modulating signal corresponding to the image pattern is stored in said second controlling means in advance as a modulating signal which controls the exposure volume of said exposure means, and

said second controlling means sends the modulating signal to said exposure means as the image signal through said second route.

16. The image forming apparatus of claim 12, further comprising counting means which is electrically connected with said first controlling means, wherein

said image forming means includes exposure means which forms an electrostatic latent image on said image carrier and developer means which makes toner adhere to said image carrier, thereby visualizing the electrostatic latent image,

said first controlling means generates print dot data based on the

image data, sends the print dot data to said counting means, generates a modulating signal which controls the exposure volume of said exposure means based on the print dot data, and sends the modulating signal as the image signal to said exposure means through said first route,

said counting means counts the number of print dots which constitute the toner image corresponding to the image data, based on the print dot data, and

when an image signal is fed to said image forming means from said first controlling means through said first route, said detecting means detects the toner amount based on the number of the print dots counted by said counting means in the first toner amount detecting process.

17. The image forming apparatus of claim 11, further comprising a judging means which judges the toner end when the toner consumption amount thus calculated exceeds a predetermined value.

18. A method of calculating a toner consumption amount for use in an image forming apparatus which comprises image forming means which forms a toner image on an image carrier based on an image signal which is fed, and in which a first route and a second route which is different from said first route are provided as routes for feeding the image signal to said image forming means, said method comprising:

a first detection step of detecting a toner amount of toner which is consumed as said image forming means forms a toner image based on an

image signal which is fed to said image forming means through said first route;

a second detection step of detecting a toner amount of toner which is consumed as said image forming means forms a toner image based on an image signal which is fed to said image forming means through said second route; and

a step of calculating a toner consumption amount based on an integrating value which is obtained by integrating the toner amounts detected at said first detection step and at said second detection step,

wherein the toner amounts are detected through different processes between said first detection step and said second detection step.

19. An image forming apparatus, comprising:

image forming means which forms a toner image on an image carrier in a predetermined unit based on an operation signal inputted from a controller;

consumption amount calculating means which adds a toner amount of toner which is used in an ordinary toner image formed by said image forming means and a toner amount, as an offset value, of toner which is consumed separately from the toner which is used in the ordinary toner image, to thereby calculate a toner consumption amount of toner consumed through a toner image forming operation which is performed by said image forming means; and

offset value setting means which changes the offset value in



accordance with an operation signal inputted from said controller.

20. The image forming apparatus of claim 19, wherein  
said image forming means forms the toner image in accordance with information regarding image forming style which is contained in the operation signal from said controller, and

said offset value setting means changes the offset value in accordance with the information regarding image forming style.

21. The image forming apparatus of claim 20, further comprising a transfer medium which rotates and on which N pages (where  $N \geq 2$ ) of toner image transfer areas are arranged next to each other across one round along the direction of rotation, wherein

said transfer medium is structured to be transferred, while rotating, the toner image on said image carrier onto each one of the toner image transfer areas,

said image forming means forms toner images on said image carrier in such a manner that toner images of one through N pages will be transferred onto the toner image transfer areas in accordance with a page count which is contained in the operation signal from said controller as the information regarding image forming style, and

said offset value setting means changes the offset value in accordance with the page count.

22. The image forming apparatus of claim 20, further comprising transfer means which transfers the toner images formed on said image carrier onto a predetermined recording medium, wherein

when an operation signal from said controller contains, as the information regarding image forming style, information indicative of that said recording medium is of a type set in advance, said image forming means forms a predetermined special toner image of a color which is hard for human eyes to recognize on said image carrier in such a manner that the special toner image is superimposed on the ordinary toner image, and

said offset value setting means changes the offset value in accordance with whether said image forming means is supposed to form the special toner image on said image carrier or not.

23. The image forming apparatus of claim 20, further comprising storage means which stores the offset value which is set for each one of a plurality pieces of the information regarding image forming style contained in the operation signal inputted from said controller,

wherein said offset value setting means extracts the offset value to be changed from said storage means in accordance with the information regarding image forming style.

24. A method of calculating a toner consumption amount, comprising:

an image forming step of forming a toner image on an image

carrier in a predetermined unit based on an operation signal inputted from a controller;

a toner consumption amount calculating step of adding a toner amount of toner which is used in an ordinary toner image formed in said image forming step and a toner amount, as an offset value, of toner which is consumed separately from the toner used in the ordinary toner image; and

an offset value setting step of changing the offset value in accordance with the operation signal inputted from said controller.

25. An image forming apparatus which forms a toner image in a predetermined unit, comprising:

consumption amount calculating means which adds a total amount of image constituting toner which constitutes the toner image and a toner amount, as an offset value, of toner which is consumed in forming the toner image separately from the image constituting toner, thereby calculating, in the predetermined unit, a toner consumption amount of toner which is consumed as the toner image is formed; and

offset value setting means which changes the offset value in accordance with an operating state of said apparatus.

26. The image forming apparatus of claim 25, wherein said offset value setting means changes the offset value in accordance with a cumulative value of print counts.

27. The image forming apparatus of claim 25, further comprising:

an image carrier structured to carry an electrostatic latent image corresponding to the toner image while rotating;

a toner carrier structured to carry toner while rotating; and

developer means which makes toner carried on said toner carrier adhere to the electrostatic latent image carried on said image carrier, visualizes the electrostatic latent image and accordingly forms the toner image,

wherein said offset value setting means changes the offset value in accordance with a cumulative number of revolutions of at least one of said image carrier and said toner carrier.

28. The image forming apparatus of claim 25, further comprising:

an image carrier structured to carry an electrostatic latent image corresponding to the toner image;

developer means which makes toner adhere to the electrostatic latent image carried on said image carrier, visualizes the electrostatic latent image and accordingly forms the toner image;

an intermediate transfer medium structured to carry a toner image while rotating; and

transfer means which transfers the toner image onto said

intermediate transfer medium which is rotating from said image carrier, and then transfers thus transferred toner image onto a recording medium from said intermediate transfer medium,

wherein said offset value setting means changes the offset value in accordance with a cumulative number of revolutions of said intermediate transfer medium.

29. The image forming apparatus of claim 25, further comprising:

developer unit which houses toner; and

toner remaining amount calculating means which calculates a toner remaining amount of toner which remains within said developer unit based on an integrating value which is obtained by integrating the toner consumption amount which is calculated in the predetermined unit,

wherein said offset value setting means changes the offset value in accordance with at least one of the integrating value and the toner remaining amount.

30. An image forming apparatus which forms a toner image in a predetermined unit, comprising:

consumption amount calculating means which adds a total amount of image constituting toner which constitutes the toner image and a toner amount, as an offset value, of toner which is consumed in forming the toner image separately from the image constituting toner, thereby

calculating, in the predetermined unit, a toner consumption amount of toner which is consumed as the toner image is formed; and

offset value setting means which changes the offset value in accordance with a history of use of toner.

31. The image forming apparatus of claim 30, wherein said offset value setting means changes the offset value in accordance with a cumulative value of print counts.

32. The image forming apparatus of claim 30, further comprising:

an image carrier structured to carry an electrostatic latent image corresponding to the toner image while rotating;

a toner carrier structured to carry toner while rotating; and

developer means which makes toner carried on said toner carrier adhere to the electrostatic latent image carried on said image carrier, visualizes the electrostatic latent image and accordingly forms the toner image,

wherein said offset value setting means changes the offset value in accordance with a cumulative number of revolutions of at least one of said image carrier and said toner carrier.

33. The image forming apparatus of claim 30, further comprising:

an image carrier structured to carry an electrostatic latent image corresponding to the toner image;

developer means which makes toner adhere to the electrostatic latent image carried on said image carrier, visualizes the electrostatic latent image and accordingly forms the toner image;

an intermediate transfer medium structured to carry a toner image while rotating; and

transfer means which transfers the toner image onto said intermediate transfer medium which is rotating from said image carrier, and then transfers thus transferred toner image onto a recording medium from said intermediate transfer medium,

wherein said offset value setting means changes the offset value in accordance with a cumulative number of revolutions of said intermediate transfer medium.

34. The image forming apparatus of claim 30, further comprising:

developer unit which houses toner; and

toner remaining amount calculating means which calculates a toner remaining amount of toner which remains within said developer unit based on an integrating value which is obtained by integrating the toner consumption amount which is calculated in the predetermined unit,

wherein said offset value setting means changes the offset value in accordance with at least one of the integrating value and the toner

remaining amount.

35. An image forming apparatus which forms a toner image in a predetermined unit, comprising:

consumption amount calculating means which adds a total amount of image constituting toner which constitutes the toner image and a toner amount, as an offset value, of toner which is consumed in forming the toner image separately from the image constituting toner, thereby calculating, in the predetermined unit, a toner consumption amount of toner which is consumed as the toner image is formed; and

offset value setting means which changes the offset value in accordance with an image forming condition which is used in forming the toner image.

36. A method of calculating a toner consumption amount for use in an image forming apparatus which forms a toner image in a predetermined unit, comprising the steps of:

calculating a total amount of image constituting toner which constitutes the toner image;

calculating a toner amount, as an offset value, of toner which is consumed in forming the toner image separately from the image constituting toner;

adding the total amount of image constituting toner and the offset value, thereby calculating a toner consumption amount of toner which is



consumed as the toner image is formed; and

changing the offset value in accordance with an operating state of said image forming apparatus.

37. A method of calculating a toner consumption amount for use in an image forming apparatus which forms a toner image in a predetermined unit, comprising the steps of:

calculating a total amount of image constituting toner which constitutes the toner image;

calculating a toner amount, as an offset value, of toner which is consumed in forming the toner image separately from the image constituting toner;

adding the total amount of image constituting toner and the offset value, thereby calculating a toner consumption amount of toner which is consumed as the toner image is formed; and

changing the offset value in accordance with a history of use of toner.

38. A method of calculating a toner consumption amount for use in an image forming apparatus which forms a toner image in a predetermined unit, comprising the steps of:

calculating a total amount of image constituting toner which constitutes the toner image;

calculating a toner amount, as an offset value, of toner which is

consumed in forming the toner image separately from the image constituting toner;

adding the total amount of image constituting toner and the offset value, thereby calculating a toner consumption amount of toner which is consumed as the toner image is formed; and

changing the offset value in accordance with an image forming condition which is used in forming the toner image.

39. An image forming apparatus in which at the time of color printing of an original image using toner in a plurality of color components, a predetermined special image formed using toner in a color component which is hard for human eyes to recognize is superimposed on the original image, said apparatus comprising:

consumption amount calculating means which adds a total amount of image constituting toner which constitutes the toner image and a toner amount, as an offset value, of toner which is consumed during the color printing separately from the image constituting toner, thereby calculating a toner consumption amount in a predetermined unit, for each color component; and

storage means which stores a plurality of offset values corresponding to the plurality of color components respectively,

wherein the offset value corresponding to the color component used in forming the special image is set to be larger than the offset values corresponding to the other color components.

40. The image forming apparatus of claim 39, wherein the offset value corresponding to the color component used in forming the special image is set to be the largest.

41. The image forming apparatus of claim 39, wherein the offset value corresponding to the toner color used in forming the special image includes a total amount of toner which constitutes a toner image of the special image.

42. The image forming apparatus of claim 39, further comprising:

pattern adding means which adds a signal corresponding to an image pattern of the special image to an image signal corresponding to the original image, thereby generating a composite signal;

exposure means which forms an electrostatic latent image on an image carrier based on the composite signal; and

developer means which makes toner adhere to the electrostatic latent image, thereby visualizing the electrostatic latent image,

wherein the offset value corresponding to the color component used in forming the special image includes the total amount of toner which constitutes a toner image of the image pattern.

43. A method of calculating a toner consumption amount for

use in an image forming apparatus in which at the time of color printing of an original image using toner in a plurality of color components, a predetermined special image formed using toner in a color component which is hard for human eyes to recognize is superimposed on the original image, said method comprising the steps of:

calculating a total amount of image constituting toner which constitutes a toner image of the original image in a predetermined unit for each color component;

setting a plurality of toner amounts of toner which is consumed during the color printing separately from the image constituting toner, as a plurality of offset values for the respective color components; and

adding the total amount of image constituting toner to the offset value for each color component, thereby calculating a toner consumption amount,

wherein among the plurality of offset values, the offset value corresponding to the color component used in the special image is set to be larger than the offset values corresponding to the other color components.